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ABSTRACT

Fifty-two fourth and fifth grade students, randomly assigned to three groups (1) competitive, (2) individualistic, and (3) no feedback control, received differential feedback regarding their performance in two 40-minute computer assisted mathematics sessions per week over six weeks. Attributions regarding academic outcomes in computer assisted mathematics were assessed prior to and following treatment, as was academic locus of control. Measures of rate of progress and achievement were also taken. Children receiving competitive feedback showed an increase in attributions to ability for success, as predicted. A predicted increase in attributions to effort for children receiving individualistic feedback was not found. Contrary to previous findings, gender differences in academic locus of control were not found, although all subjects showed an increase in internal responsibility for academic outcomes over the treatment period. Predicted increases in rate of progress and mathematics achievement by the individualistic feedback group in comparison with the competitive feedback and control groups were not found. Feedback conditions were found to differentially affect males and females with males exhibiting a significantly higher rate of progress than females within the competitive feedback group. Attributions were found to account for a moderate, significant portion of the variance in rate of progress and mathematics achievement. (Author/JM)

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Attributional And Performance Effects Of Competitive And Individualistic Feedback In Computer Assisted Mathematics Instruction

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RUNNING HEAD: COMPETITIVE AND INDIVIDUALISTIC FEEDBACK

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Abstract

Fifty-two fourth and fifth grade students, randomly assigned to three groups: competitive, individualistic, and no feedback control, received differential feedback regarding their performance in two 40-minute computer assisted mathematics sessions per week over a six week period. Attributions regarding academic outcomes in computer assisted mathematics were assessed prior to and following the treatment period, as was academic locus of control. Measures of rate of progress and achievement were also taken. Children receiving competitive feedback showed an increase in attributions to ability for success, as had been predicted. However, a predicted increase in attributions to effort on the part of children receiving individualistic feedback was not found. Contrary to previous findings, gender differences in academic locus of control were not found, although all members of the subject population showed an increase in internal responsibility for academic outcomes over the treatment period. Predicted increases in rate of progress and mathematics achievement on the part of the individualistic feedback group in comparison with the competitive feedback and control groups were not found. However, feedback conditions were found to differentially affect males and females, with males exhibiting a significantly higher rate of progress than females within the competitive feedback group. Attributions were found to account for a moderate, significant portion of the variance in rate of progress and mathematics achievement.

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Classroom goal structures (e.g.,competitive, individualistic, and cooperative) have been found to exert a powerful influence on student achievement. In a meta-analysis of 122 studies of the effects of goal structures on achievement, Johnson, Maruyama, Johnson, Nelson, and Skon (1981) reached three broad conclusions: (1) that cooperation is superior to competitive and individualistic structures, (2) that cooperative goal structure with competition between groups is superior to both interpersonal competitive and individualistic structures, and (3) that competitive and individualistic structures do not have significant differential effects on achievement. Other reviewers have reached different conclusions (see Hayes,1976; Slavin,1977). While comparisons of the three goal structures have resulted in a number of controversies, most reviewers conclude that competitive and individualistic goal structures do not produce differential effects on achievement.

A related issue involves the effects of different goal structures on children's causal attributions, and the use of attributions as an explanatory theoretical network for the effects of goal structure on achievement. Initial investigation of characteristic attributions resulting from exposure to competitive and individualistic goal structures showed few differences (Ames & Felker,1979). However, the lack of differential effects appears to have been an artifact of the manner in which individualistic goal structure is defined. When individualistic goal structure is characterized as comparison with one's own past performance, rather than comparison with external standards, differences in attributions are evident (Ames, 1984a).

Competitive goal structures seem to foster ability

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attributions for success and failure. In contrast, individualistic reward structures are more likely to result in effort attributions. Ames (1984b) asserted that competitive situations foster a focus on "winning", while individualistic situations result in a focus on "task-mastery", and that these different performance contexts influence the types of attributions that result.

Veroff (1969) hypothesized the development of two types of achievement motivation in children: autonomous and social achievement motivation. Autonomous achievement motivation, based on the child's internalized standards for performance, was thought to develop first, subsequently being replaced by social achievement motivation, based on comparison of one's performance with the performance of others. Support for Veroff's developmental hypothesis was provided by the results of Feldman and Ruble (1977) and Feld, Ruhland, and Gold (1979); however, it was found that the social achievement motive did not replace the autonomous achievement motive. Rather, the development of the social achievement motive serves to expand the types of situations that children view as achievement related (Feld, et al., 1979).

The social comparison process inherent in competitive goal structures has been criticized as contributing to a self-defeating situation for the low achievers in the comparison group. Nicholls (1979) suggested that social comparison for low achievers may be predicted to lead to the maintainance of a low self-concept of ability and, thus, low achievement motivation. Given that competitive goal structures foster ability attributions, the result of social comparison by the low achievers could be expected to result in the perception of failure and the attribution of

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failure to lack of ability. With individualistic goal structures no such possibility for social comparison exists. Attribution of failure to ability might be predicted to result in lower levels of motivation and, hence, to lower levels of achievement within competitive goal structures as compared to individualistic goal structures.

In the process of deriving predictions about the effects of classroom reward structures, it is also necessary to consider the findings related to gender differences in attributions for success and failure. Many investigators have reported that females tend to accept more responsibility than males for negative academic outcomes (see Cooper, Burger, & Good, 1981). In addition, it has been suggested that males tend to attribute failure to unstable factors such as luck or effort, whereas females tend to attribute failure to internal, stable factors such as ability (Dweck & Gilliard,1975; Dweck & Repucci,1973). The attribution of failure to internal, stable factors has been associated with the learned helplessness condition (Dweck & Repucci,1973). It should be noted that attribution-linked performance deficits (e.g., helplessness) observed in females may be related to the source of the evaluative feedback. Dweck and Bush (1976), for example, found that females exhibited attribution-linked performance deficits with adult evaluators, but not with peer evaluators.

While much effort has been directed at the effects of computer based instruction (CBI) on the achievement of students (see Kulik, Bangert, & Williams,1983 for a review) very little attention has been given to attributions elicited by computer based instruction (CBI). Only one recent study has examined the effects of different goal structures in computer based education.

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Johnson, Johnson, and Stanne (1985) compared the performance of eighth graders within cooperative, competitive, and individualistic goal structures. Their results suggested that cooperation produced the most positive effects on achievement and attitude of the three goal structures. They also pointed out that competition had differential effects on males and females, with females exhibiting debilitated achievement and attitudes.

The literature reviewed here indicates that the relative effects of competitive and individualistic goal structures on students' attitudes and achievement merit closer scrutiny. The present study was designed to assess the effects of different reward structures on students' attributions and achievement behavior within the context of computer based education. Specifically:

1. Children exposed to competitive feedback were expected to exhibit greater ability attributions after the treatment, both in comparison with their own pre-treatment scores and with the post-treatment scores of children given individualistic feedback.
2. Children given individualistic feedback were expected to exhibit greater effort attributions after the treatment, both in comparison with their own pre-treatment scores and with post-treatment scores of children given competitive feedback.
3. Females were expected to exhibit greater internal responsibility for negative academic outcomes than males.
4. Children given individualistic feedback were expected to exhibit higher levels of achievement behavior, as evidenced by rate of progress and mathematics achievement measures, in comparison with children given competitive feedback and controls.
5. Based on the hypothesized relationship between attributions

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and achievement (cf. Weiner,1979), it was predicted that attributions for success and failure would account for a statistically significant portion of the variance in the mathematics achievement and rate of progress measures.

Method

This study involved a pre-test, post-test, control group design. Every effort was made to maintain normal classroom conditions and to minimize disruption of the instructional process. Measures of generalized academic locus of control and computer-math specific attributions were administered two weeks prior to initiation of the treatment. The treatment phase lasted a total of six weeks, with two forty minute CAI mathematics sessions per week. Finally, computer-math-specific attributions were assessed immediately following conclusion of the treatment, along with academic locus of control and mathematics achievement. A total of 11 presentations of feedback were administered.

Subjects

The subjects for this study were 52 4th and 5th grade students from a university laboratory school. The group was comprised of 25 males (mean age 10.35) and 27 females (mean age 10.27). Students were selected from two classrooms and randomly assigned to treatment conditions via the roll of a die, with the restriction that the treatment groups contained an approximately equal number of males and females.

Apparatus And Materials

The WICAT system.

The system used in the delivery of instruction and feedback was the WICAT System 300. The System 300 operates 30 individual student terminals consisting of a video display monitor and a

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standard keyboard for entering responses. The system is located in a facility used solely for computer assisted instruction. Student terminals are housed in individual carrels. Different feedback conditions were administered to members of the experimental and control groups simultaneously.

The WICAT mathematics curriculum is an interactive program designed to supplement regular classroom instruction in grades K-8. The content level in use by the students in this study includes addition, subtraction, whole numbers, division, multiplication, fractions, and decimals. Goals and objectives of the curriculum parallel the objectives reflected in common mathematics texts used in the United States. During the course of this study, subjects were "locked in" to an automatic progress mode which insured that students were working at appropriate difficulty levels rather than remaining at levels that they had already mastered.

Procedure

Competitive feedback (CF).

CF Group members received normative performance information regarding their rate of progress through the mathematics curriculum relative to other members of the group. Rate of progress was defined as number of lessons completed divided by time logged on to the computer. Feedback was presented via WICAT video monitor at the beginning of each CAI math session.

A rank order criterion was chosen in order to stimulate social comparison within the CF group without the necessity of direct comparison of the performance of individual subjects. Thus, confidentiality of subjects' performance data was preserved. Students were given visual feedback regarding individual rank

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relative to the median rank of the group.

At the top of the display, numerical rank was presented. Rank information for the present session and the previous session was presented in bar graph form in the center of the video display. In addition to the numerical rank and graphic presentations, subjects in the CF condition received a verbal message regarding change in rank from their previous standing. Students moving up in rank received a message stating, "You moved up in rank this time." Subjects moving down in rank received a message stating, "You moved down in rank this time." Subjects ranking the same received a message stating, "Your rank stayed the same as last time." After viewing the feedback display, students pressed the escape key on their terminals and proceeded with the normal WICAT curriculum. Initial class ranking was based upon cumulative data regarding the students' performance in WICAT mathematics to date.

Individualistic feedback(IF).

Individualistic feedback group members received feedback information in a similar format to that of the CF group. However, their feedback was presented in relation to their own past performance, rather then relative to the performance of the group. The visual display consisted of a bar graph, with current progress superimposed on previous week's performance. Students showing improvement in progress through the curriculum received a verbal message stating, "You completed more lessons this time than last." Students showing a decrease in progress through the curriculum received a message stating,"You completed fewer lessons this time than last." Students having the same rate of progress received a message stating,"Same as last time." As with the CF group, IF

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group members pressed the escape Key after viewing feedbacK and proceeded with the WICAT mathematics curriculum. Initial performance feedbacK was calculated from WICAT system performance data from the student's two preceding sessions.

No feedbacK(NF).

The NF group received normal WICAT mathematics instruction, and were not exposed to any feedbacK other than that normally provided by the system. This feedbacK is criterion-referenced and involves information regarding the number of problems solved correctly in a given lesson. Students also receive information regarding number of lessons completed within units and units which have been finished. The NF group served as the experimental control for this study.

Dependent Measures

Rate of progress.

The WICAT mathematics curriculum is divided into sixteen units, containing 407 lessons. Lessons contain an average of eight problems. Number of lessons completed during each session was divided by time spent to yield a rate of progress measure. This measure was chosen over absolute number of lessons completed in order to compensate for possible absenteeism. The rate measure was computed after each WICAT mathematics session and used in determination of feedbacK. In addition, a rate measure for the entire treatment period was computed.

Academic locus of control.

The Intellectual Achievement Responsibility Scale (IAR) (Crandall, KatKovsKy & Crandall,1965) is a measure of generalized expectation for internal/external control of reinforcement in academic achievement situations. The IAR has been used extensively

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in research on the attributions that children make in achievement situations. Cooper, Burger and Good (1981), in conducting a meta-analysis of research regarding gender differences in academic locus of control, found approximately 200 that used the IAR. As such, it provides a point of comparison with other research in the field.

The IAR consists of thirty-four forced-choice items representing common academic success (17 items) and failure (17 items) experiences. Students are presented with a situation and asked to choose between an internal and an external cause. Scores for internal items (I+) and external items (I-) are computed, and the summation of these scores forms a global internal-external score (I). This score represents degree of internality of beliefs about responsibility for reinforcement.

In order to compensate for different reading levels of children involved in this study, IAR items were read by the researcher to the students in their classrooms. Administration of the IAR took place approximately two weeks prior to the initiation of the treatment phase of this study, and again immediately following the end of the treatment.

Computer math-specific attributions.

Attributions were measured utilizing an adaptation of an experimental scale developed by Elig and Frieze (1979). The present scale consisted of sixteen five-point rating scales. Items were designed to assess eight common attributions (stable effort, task interest, mood, motivation, ability, task difficulty, luck, and unusual effort) for success and failure. Success and failure items were randomly ordered and presented in a paper and pencil format. In order to compensate for different reading levels of

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students involved, items were read to subjects by the researcher.

Each item contained an attributional statement, with the rating scale immediately below it. Increments along the scale were presented graphically by a series of five circles of gradually increasing size, representing the five points of the scale. The endpoints and midpoint of the scale were indicated by the statements "not important", "very important", and "Kind of important".

Reliability of this instrument for the age group under study was checked by administering the scale to 41 sixth grade students and determining test-retest reliability after a five day interval. Three different indices of reliability of the scale were computed. Correlations between first and second administrations of scale items ranged from .12 to .74, with a mean correlation of .46. Percentage of exact agreement between first and second administrations ranged from .32 to .71, with a mean percentage of agreement of .50. Percentage of agreement plus or minus one ranged from .74 to .97, with a mean of .85.

Mathematics achievement measure.

Mathematics achievement was assessed through the use of a criterion-referenced measure reflecting the WICAT mathematics curriculum. Items representative of each level of the WICAT mathematics curriculum were randomly generated by the WICAT system and administered to subjects as a thirty item test.

Results

Attributions

Hypotheses regarding predicted shifts in subject's attributional perceptions were tested using the procedure for *a priori* planned orthogonal comparisons. Comparisons were made both

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between and within groups. Means for these analyses are presented in Table 1.

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insert Table 1 about here

No significant differences were discovered between IF and CF group members in attributions to specific or usual effort or to ability for either success or failure outcomes. In addition, no differences were found for males and females taken separately or for IF and CF groups collapsed across the gender factor.

Within group comparisons indicated that children receiving competitive feedback exhibited significantly higher levels of attributions to ability for successful outcomes after the treatment period ($t(46)=1.748, p<.05$). The predicted increase in effort attributions on the part of IF group members was not supported. No gender differences were discovered in any of the within group comparisons.

Locus of Control

A priori predictions regarding gender differences in academic locus of control were examined using planned orthogonal comparisons. Contrary to prediction, no significant gender differences were discovered on any of the IAR scores. This finding was consistent for both pre and post administrations of the IAR.

Post hoc analysis of IAR scores was conducted using multivariate analysis of variance (MANOVA) with IAR scores for success, failure, and overall internality as dependent variables. A 2x3x2 design was employed, with feedback conditions as the three treatment factors and subject gender as the second factor. Time was the third factor.

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The MANOVA revealed that a significant shift in academic locus of control occured for all members of the treatment population over the course of the treatment period ($F(3,43)=3.26, p=.030$). This finding held for overall internality ($F(1,46)=9.54, p=.003$), internality for successful outcomes ($F(1,46)=6.05, p=.017$), and internality for failure outcomes ($F(1,46)=4.23, p=.045$). Examination of pre- and post-administration IAR scores indicate that the direction of the change is toward greater perceptions of internality in all cases on the post-administration. Means for this analysis are reported in Table 2.

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insert Table 2 about here

Rate of Progress and Achievement

Rate of progress through the mathematics curriculum was computed for the 11 successive feedback displays administered during the course of the treatment period. Rate of progress was computed for the control group at the same intervals.

A priori hypotheses regarding group differences in overall rate of progress were tested using a t ratio. No evidence was found to support the prediction of higher rate of progress for IF group members as compared with CF group members and controls.

Rate of progress data were also analyzed using a 2x3x11 factorial analysis of variance (ANOVA). The two treatment conditions and the control condition constituted the three levels of the treatment factor and subject gender constituted the second factor. The 11 rate of progress measures constituted a third within group factor.

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A significant groupxgender interaction was found ($F(2,46)=4.21, p=.020$). Post hoc comparisons using the Duncan Studentized Range statistic indicated that the signifcant F value for interaction was due to a significantly higher mean rate of progress on the part of CF males as compared with CF females. No corresponding gender differences were discovered in the IF or control groups. However, IF females exhibited a significantly higher rate of progress than CF females and control group males. Means for these analyses are reported in Table 3, and are represented graphically in Figure 1.

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insert Table 3 about here

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Effects of the treatment on mathematics achievement were tested using a 2x3 ANOVA. The three treatment conditions constituted the first factor and subject gender constituted the second factor. Contrary to prediction, no significant main effects were discovered on either the group or gender factors.

Regression Analysis

Regression analyses were conducted using attributions as predictor variables. Separate analyses were conducted for rate of progress and mathematics achievement. The procedure employed maximized R^2 values regardless of the significance of individual parameters. Best fitting regression models were determined using both the F statistic and the Cp statistic.

Regression data for mathematics achievement are reported in

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Table 4. Attributions included specific effort for success and failure, usual effort for success, luck for success and failure, and overall motivation for success. This model accounted for a significant portion of the variance (R^2=.250) in mathematics achievement (F(6,46)=2.51,p=.035).

Regression data for overall rate of progress are reported in Table 5. Attributions included ability for success and failure, mood for success, motivation for success and failure, luck for failure, overall interest for success, and specific effort for success. The model accounted for a significant portion of the variance (R^2=.291) in rate of progress (F(8,43)=2.21,p=.045).

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insert Table 4 about here

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insert Table 5 about here

Discussion

The results of the analysis of achievement behavior represent the most important finding of this study. While no significant main effects were observed for the group factor in rate of progress, the results clearly indicate that the treatment conditions differentially affected the performance of males and females within the treatment groups.

Competitive group males exhibited a significantly higher rate of progress than females within that condition. This finding is consistent with the conception that females are less likely to engage in competitive tasks due to differential socialization practices which discourage "winning" when victory comes at the

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expense of others (Maccoby and Jacklin,1974). Horner (1970) suggested that females may actually develop a motive to avoid success. Fear of success is seen as the result of a belief that it is not acceptable for females to "beat" males, particularly in direct competition. Maccoby and Jacklin (1974) pointed out that females do not seem to have any difficulty competing when the situation is indirect (e.g., grades). However, when the situation becomes direct, particularly when ranking is involved, males' achievement behavior seems to be stimulated, while females seem to experience the reverse. This approximates the conditions created in the CF group in the present study.

Further evidence for the view that females' achievement is debilitated in direct competitive situations is found in the significantly greater rate of progress for IF group females as compared to both CF females and control group males. Exposure to a competitive atmosphere clearly had a negative effect on females' performance. Johnson,et al., (1985) found a similar debilitation of females' performance in competitive conditions.

The second measure of achievement behavior, a mathematics achievement measure referenced to the WICAT mathematics curriculum, did not result in any significant group or gender differences. This finding is perhaps not surprising in light of the relatively short treatment period. While rate of progress must certainly contribute to level of achievement, this contribution would require a long period of time to actually raise measured levels of achievement.

Analysis of the attributional data was only partially supportive of Ames's (1984b) assertion that competitive goal structures result in a focus on winning rather than on task

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mastery, and that that focus leads to attributions to ability for academic outcomes. Children receiving competitive feedback did show an increase in ability attributions for success as a result of the treatment, but a corresponding increase in effort attributions on the part of IF group members was not found. The lack of gender differences in ability attributions in the CF group is particularly interesting, given the dramatic difference in rate of progress.

Ames' (1984b) results were obtained in a controlled situation where competition was explicitly encouraged between pairs of children matched on ability, with a clear winner declared in each trial. The present study reflected a naturalistic classroom situation in that the rank order feedback was designed to implicitly stimulate social comparison among CF group members. Subjective observation of subjects' reactions to the competitive and individualistic feedback indicated that, among CF group members, a great deal of spontaneous social comparison of rank order information took place. In contrast, there was little social comparison of feedback among IF group members and none among control group members.

It is possible that unless the competitive nature of the task is made apparent, with definite "winners" and "losers", the previously observed attributional shifts will not occur. Support for this view is found in the suggestion by McHugh, Fisher, and Frieze (1982) that the higher level of competitiveness induced by direct competition may be necessary for shifts in attributional perceptions to take place.

The findings regarding the attributional effects of exposure to individualistic feedback are more difficult to interpret. The

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most likely explanation is that the subjects of the experiment were already accustomed to receiving feedback that was individualistic in nature in CAI mathematics. This prior exposure may have attenuated the effects of the treatment on IF group members.

The lack of evidence for gender differences in academic locus of control was also contrary to previous findings. Crandall, et al (1965) found that females were more likely to accept responsibility for negative academic outcomes than males, while accepting less responsibility for positive outcomes. No evidence was found in the present study to support these relationships. This finding is particularly significant in that the instrument used to assess academic locus of control (the IAR) was the same employed in the Crandall study.

Cooper,et al.(1981), in a naturalistic study of childrens' perceptions of academic locus of control, as measured by the IAR, found that expected gender differences were only in evidence at the end of the school year. That the present study took place during the fall may explain the failure to uncover any gender differences.

In addition, there was a significant trend toward greater internality on the part of all members of the subject population in the present study. In discussing the lack of evidence for gender differences in academic locus of control early in the school year, Cooper, et al (1981) suggest that children may "forget" their differences over the summer months, when they are not attending school. This, then, would suggest that observed gender differences may be an artifact of the school environment, rather than the larger social environment of the child. This view

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is supported by the evidence regarding the importance of teacher evaluative feedback on the attributional perceptions of school children presented by Dweck, Goetz, and Strauss (1980). It is possible that gender differences in perceptions of control over academic outcomes is "taught" rather than carried into the school setting.

The regression of attributional variables on mathematics achievement scores and overall rate of progress yielded some interesting results. While these results must be viewed as exploratory due to the small n involved, the moderate R^2 values provide support for the contention that attributions are significantly related to achievement behavior (Weiner,1979).

Of particular interest are the attributional variables that are included in the regression model for mathematics achievement. Greene (1985) found that the salient predictors of academic achievement are self-concept of ability and success and failure attributions to ability. This relationship held true for the regression analysis of attributions on rate of progress, although attribution for success to specific effort was also included in the model.

The situation was different for the best predictive model for mathematics achievement. Contrary to previous findings, neither of the ability attributions were included in the model. In contrast, three of the four effort attributions were included in the model. Greene (1985) suggests that her findings provide a challenge to effort-based attribution retraining programs (Dweck,1975,Andrews and Debus,1978). The present findings indicate that perceptions regarding the importance of expenditure of effort are related to achievement-related behaviors, at least within the context of

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computer assisted mathematics instruction.

While the differential effects of competitive and individualistic feedback conditions cannot be linked to attributional changes, the results of this study suggest that caution should be taken in the design of instructional software to avoid the creation of learning materials which inadvertantly stimulate male performance while inhibiting that of females. Kiesler, Sproull, and Eccles (1983) point out that computers are a predominantly male domain, and that care should be taken not to shut females out of that domain. One tool of exclusion might be an over-emphasis on tasks which have a competitive undertone.

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Table 1

Mean Attributions to Ability and Effort by Group

Attribution		IF* $\bar{X}^{T1}$	IF* S.D.	IF* $\bar{X}^{T2}$	IF* S.D.	CF** $\bar{X}^{T1}$	CF** S.D.	CF** $\bar{X}^{T2}$	CF** S.D.
Ability	S[a]	4.368	1.011	4.315	0.885	[4.125	0.457	4.562	0.512]
	F[b]	3.631	1.535	2.684	1.416	3.062	1.526	3.312	1.447
Specific	S	4.684	0.582	4.578	0.768	4.562	0.512	4.625	0.619
Effort	F	3.631	1.770	3.684	1.376	3.562	1.631	3.750	1.570
Usual	S	4.789	0.418	4.789	0.535	4.312	0.793	4.687	1.014
Effort	F	4.263	1.367	3.789	1.652	3.437	1.711	3.312	1.740

*n = 19

**n = 16

[a] Successful outcome [b] Failure outcome

Note: Means within brackets differ significantly at $p < .05$.

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Table 2

IAR Means Collapsed Across Group and Gender

	n	Pre Administration		Post Administration	
		$\bar{X}$	S.D.	$\bar{X}$	S.D.
I+	52	[13.980	2.218	14.634	1.960]
I-	52	[11.096	2.386	11.826	2.587]
I	52	[25.076	3.864	26.423	3.947]

Note: Means within brackets differ significantly at $p < .05$.

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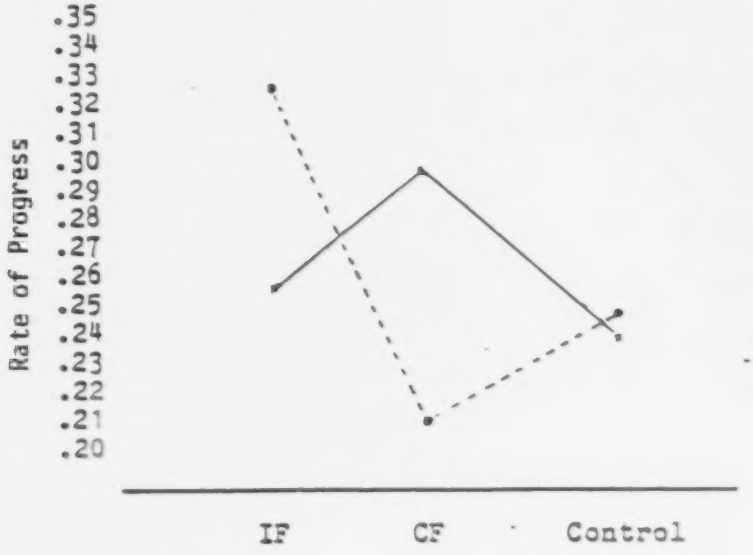
Table 3

Rate of Progress Means by Group and Gender

Group		N	$\bar{X}$	S.D.
Control	M	88	.240	.140
	F	98	.249	.178
Individualistic	M	99	.258	.165
Feedback	F	110	.324	.175
Competitive	M	88	[.298]	.190
Feedback	F	88	[.210]	.158

Note: Means within brackets differ significantly at $p < .05$



X = Male
O = Female

Figure 1. Mean Rate of Progress by Group and Gender.

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Table 4

Regression Analysis of Attributional Data on Mathematics Achievement

Variable (Outcome)	B Value	Standard Error	F	P
Specific Effort (Failure)	0.782	0.536	2.130	0.151
Usual Effort (Success)	-1.211	1.068	1.290	0.262
Luck (Failure)	0.725	0.720	1.010	0.319
Specific Effort (Success)	2.077	1.213	2.930	0.093
Luck (Success)	-1.272	0.581	4.790	0.033
Motivation (Success)	-0.781	0.872	0.800	0.374

R^2 = .250. F(6,45) = 2.51. P = .035. Cp = 1.481.

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Table 5

Regression Analysis of Attributional Data on Rate of Progress

Variable (Outcome)	B Value	Standard Error	F	P
Ability (Success)	0.180	0.015	1.380	0.246
Mood (Success)	-0.170	0.010	2.670	0.109
Motivation (Failure)	-0.075	0.007	1.050	0.312
Luck (Failure)	0.013	0.009	1.970	0.167
Interest (Success)	-0.029	0.021	1.850	0.181
Specific Effort (Success)	0.210	0.020	1.150	0.290
Ability (Failure)	-0.024	0.008	8.760	0.005
Motivation (Success)	0.019	0.014	1.750	0.192

R^2 = .291. F(8,43) = 2.21. P = .045. Cp = 3.286.

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